

What is claimed is:

1. A magnetic recording medium comprising:

a non-magnetic substrate;

at least a soft magnetic undercoat film comprising a soft magnetic material and formed on the non-magnetic substrate;

an orientation control film formed on the soft magnetic undercoat film for controlling an orientation of a film directly above the orientation control film;

a perpendicular magnetic film which is formed on the orientation control film and has an axis of easy magnetization oriented mainly perpendicularly with respect to the substrate; and

a protection film formed on the perpendicular magnetic film,

wherein the perpendicular magnetic film has a structure in which a large number of magnetic grains are separated by a grain boundary layer, and an average separating distance between the magnetic grains along a straight line which connects centers of gravity of mutually neighboring magnetic grains is 1 nm or greater, and

wherein the perpendicular magnetic film comprises a CoPtX type alloy (X being at least one of SiO₂, SiO, Si₃N₄, Al₂O₃, AlN, TiO, TiO₂, TiN, BN, CaF₂, and TiC), and when an X concentration in the magnetic grains is c1, and an X concentration in the grain boundary layer is c2, c2/c1 is 1.4 or greater.

2. A magnetic recording medium comprising:

a non-magnetic substrate;

at least a soft magnetic undercoat film comprising a soft magnetic material and formed on the non-magnetic substrate;

an orientation control film formed on the soft magnetic undercoat film for controlling an orientation of a film directly above the orientation control film;

a perpendicular magnetic film which is formed on the orientation control film and has an axis of easy magnetization oriented mainly perpendicularly with respect to the substrate; and

a protection film formed on the perpendicular magnetic film,

wherein the perpendicular magnetic film has a structure in which a large number of magnetic grains are separated by a grain boundary layer, and an average separating distance between the magnetic grains along a straight line which connects centers of gravity of mutually neighboring magnetic grains is 1 nm or greater, and

wherein the perpendicular magnetic film comprises a CoCrPtX type alloy (X being at least one of SiO₂, SiO, Si₃N₄, Al₂O₃, AlN, TiO, TiO₂, TiN, BN, CaF₂, and TiC), and when an X concentration in the magnetic grains is c1, and an X concentration in the grain boundary layer is c2, c2/c1 is 1.4 or greater.

3. A magnetic recording medium according to claim 1, wherein an average grain diameter of the crystal grains is 4 to 12 nm.

4. A magnetic recording medium according to claim 2, wherein an average grain diameter of the crystal grains is 4 to 12 nm.